

more especially those of the two last-named workers. There are no serious discrepancies between the cycle in the fly sketched by Bruce, Hamerton, and Bateman and that described above, except that I consider the fly history to be in reality a double development. In many points my work is also in agreement with that of Kleine and Taute,* except that I do not consider that the "male" forms described by them play any important part in the cycle. A further discrepancy consists in the view held by the latter authors at the time of writing their paper in regard to the salivary gland phases being a non-essential part of the cycle. My interpretation of the endogenous cycle in the blood of the vertebrate is at present, so far as I am aware, unconfirmed by other workers, largely, I imagine, owing to the fact that the interest has been concentrated for some time past on the appearances in the fly rather than on those in the vertebrate.

On the Comparative Anatomy and Affinities of the Araucarieæ.

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(Abstract.)

From a study of the anatomy of the different regions of the plant, evidence is found of the relationship of the Araucarieæ to the Cordaitales.

In the first place, the presence of a leaf gap opposite the outgoing foliar trace, in all forms whether the leaf be large or small, is taken as indicating the Pteropsid ancestry of these forms and is considered of sufficient importance to preclude the possibility of the Lycopsid connection of the Araucarieæ, of which view Seward has been the recent exponent. The presence of a gap in the cone and in the seedling seems to put the question beyond doubt, since this indicates the *ancestral presence* of a leaf gap.

One evidence of relationship to the Cordaitales is found in the retention of Cordaitean pitting of the tracheids in the different regions of the plant which are recognised as primitive, in the cone especially, where the pitting may be as much as 5-seriate, the pits, alternate, hexagonal and extending from end to end of the tracheid as in the Pteridosperms and the primitive members of the

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72 Comparative Anatomy and Affinities of the Araucarieæ.

Cordaitales. In medullary ray structure, too, all the forms are Cordaitean—the ray cells thin walled and with numerous pits on the tracheids where the cells come into contact with them. In both groups the rays are resinous but devoid of resin canals. In both there are ligneous parenchyma cells and resinous tracheids in the secondary wood. The latter are considered the ancestral form of the resin tissue from which the other types in the secondary wood of the conifer series have been derived. With regard to leaf traces, too, both groups agree—the trace may be single or double even while it is still in the secondary wood. In the leaf there is centripetal primary wood directly opposite the protoxylem.

In no case was there found in the primitive regions of the Araucarian forms any indication of Abietinean structure, which would be expected if the view of the Abietinean ancestry of Araucarieæ which is advocated by Jeffrey be correct. In contrast to this, in the primitive regions of the Abietineæ there are evidences of Araucarian pitting, etc. In addition, evidence is advanced to show that the transitional forms upon which the claim for the greater age of the Abietineæ is based, indicate rather the derivation of the Abietineæ from the Araucarieæ or Cordaitales. Of special interest in this connection is the evidence that the traumatic resin canals of Araucariopitys are of a primitive type and in the process of *acquirement*. The determining points are the resemblance of these to both the normal ones of the cone and to the traumatic series of the vegetative parts of the living pine and their difference from those of such a form as *Abies*, where it has been shown that resin canals are *revived* by injury. The Abietinean theory of the ancestry of the Araucarieæ recognises only traumatic series of the "revival" type, and yet there is no record of authentic Abietinean forms, as has been recently shown, either in or previous to the Triassic, in which the first Araucarian supposed to be derived from the Abietineæ (*Woodworthia*) makes its appearance. Thus geologically as well as structurally the superior antiquity of the Araucarieæ rests upon a very firm basis. This basis is made the more secure by the practically unbroken sequence of forms with essentially Araucarian structure right up to the Triassic.

In every respect confirmation of the old view has been found, which regards the Araucarieæ as anatomically very closely associated with the Cordaitales.